Overall Approach

The goal of this application is to count the number of sheets in a provided image. The process begins by accepting an image upload from the user. The uploaded image is then processed through a series of computer vision techniques to identify and count the distinct sheet contours. The approach includes converting the image to grayscale, adjusting the contrast for better visibility, applying Gaussian Blur to reduce noise, and utilizing edge detection methods to find contours. By filtering for rectangular shapes, the application effectively counts the number of sheets present in the image.

Frameworks/Libraries/Tools

- **OpenCV**: A powerful library for computer vision tasks that allows for image processing, contour detection, and edge detection.
- **NumPy**: A library used for handling arrays and performing numerical operations, which is essential for manipulating image data as numpy arrays.
- **Streamlit**: A framework for building web applications for data science projects. It provides a user-friendly interface to upload images and display results interactively.
- **PIL (Python Imaging Library)**: Used to handle image file uploads and conversions between different formats to ensure compatibility with OpenCV.

Challenges and Solutions

- **Image Quality Variations**: Different images may have varying lighting conditions and backgrounds that can affect the contour detection accuracy.
    - **Solution**: Implemented contrast adjustment and Gaussian Blur to standardize images before processing, improving the clarity of contours.
- **Contour Detection Accuracy**: Identifying sheets correctly amidst noise and other shapes in the image was challenging.
    - **Solution**: Applied edge detection and filtered contours to retain only those that are likely to be sheets, specifically focusing on rectangular shapes with four corners.
- **User Interface**: Creating an intuitive interface for users to upload images and view results was important for user experience.
    - **Solution**: Leveraged Streamlit to create a simple and responsive interface that guides users through the upload and result display process.

Future Scope

- **Enhanced Sheet Detection**: Implement machine learning models trained on a variety of sheet images to improve detection accuracy in complex scenarios.
- **Multi-Image Upload**: Allow users to upload multiple images at once and receive a consolidated count for all sheets across images.
- **PDF Integration**: Enable users to upload PDF documents and extract images for sheet counting directly from them.